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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,661	10/29/2001	Remis Balaniuk	S00-226/US	3916

30869 7590 05/25/2005

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EXAMINER	
GEBRESILASSIE, KIBROM K	
ART UNIT	**PAPER NUMBER**
2128	

DATE MAILED: 05/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/016,661	BALANIUK ET AL.	
	Examiner	Art Unit	
	Kibrom K. Gebresilassie	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/29/2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 October 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The action is responsive to the application filed on October 29, 2001.

2. Claims 1-35 are examined.

Oath/Declaration

3. The office acknowledges receipt of a properly signed oath/declaration filed on October 29, 2001.

Information Disclosure Statement

4. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A (1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Drawings

5. The drawings are objected to under 37 CFR 1.83(a) because they fail to show Px, Py, Pz and the rigid probe as described in the specification. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views

of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

6. The disclosure is objected to because of the following informalities:

i. The letter d has been used to designate both distance and density (see on page 17, line 15 and on page 21 line 12).

ii. The external pressure is shown as P_{ext} (see on page 19 line 20). However, external pressure is shown as P_{env} (see on page 20 line 20).

iii. Need to specify what *k* stands for (see on page 19 line 10)

iv. The letter P has been used to designate pressure (see on page 18 line 27), point (see on page 27 line 7) and particle (see on page 27 line 16).

v. The letter *n* has been used to designate the total number of long elements (see on page 21 line 29) and length of a side of deformable medium (see claim 1, lines 7-8).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 16,17,19,31 and 33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 16 recites client-server architecture.

Claims 17 and 31 recite a network environment.

Claims 19 and 33 recite a portable device.

The above claimed limitations are nowhere found described in the specification.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

10. Claims 22 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22 recites the limitation "said reference planes", line 8. There is insufficient antecedent basis for this limitation in the claim.

Claim 29 recite the limitation "said reference planes" in on page 43 line 10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 101

11. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

12. Claims 1-9 are rejected under 35 U.S.C. 101 because the claimed invention is drawn to non-statutory subject matter. The Examiner submits that Applicant's have not recited any limitations relating to a practical application in the technological arts and

have merely claimed a manipulation of mathematical steps. Section 2106 [R-2] (Patentable Subject Matter - Computer-Related Inventions) of the MPEP recites the following:

"In practical terms, claims define nonstatutory processes if they:
- consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
- **simply manipulate abstract ideas**, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), **without some claimed practical application**."

In this case, claims 1-9 are simply drawn to the manipulation of abstract ideas (long elements method which reduce the number of time steps required by modeling).

An invention which is eligible for patenting under 35 U.S.C. § 101 is in the "useful arts" when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a "**useful, concrete and tangible result.**" The test for practical application as applied by the examiner involves the determination of the following factors:

(1) "Useful" - The Supreme Court in Diamond v. Diehr requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the asserted utility is accomplished.

(2) "Tangible" - Applying In re Warmerdam, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and step of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. § 101. In Warmerdam the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium, which enabled its functionality to be realized.

(3) "Concrete" - Another consideration is whether the invention produces a "concrete" result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. § 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

The Examiner respectfully submits, under current PTO practice, that the claimed invention does not recite either a useful, concrete, or tangible result and is merely drawn to a manipulation of abstract ideas.

- The invention is not **useful** since the steps of claims 1-9 does not recite a result that is useful in the technological art. This makes it difficult to determine Applicant's invention since it merely claims a manipulation of abstract ideas, which a method allowing to reduce number of time steps of modeling.
- The claims are not **tangible** since, for example, the results of a method of reducing number of time steps of modeling are not given.
- The claims are not **concrete** because the results are not assured. For example, the out come of deformable medium modeling is not definite. Because the invention cannot operate without undue experimentation.

Dependent claims 2-9 inherit the deficiency of the claim from which they depend.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

14. Claims 1 – 35 are rejected under 35 U.S.C. 102(a) as being anticipated by Ivan F. Costa and Remis Balaniuk, "LEM – An approach for real time physically

based soft tissue simulation" proceeding of the 2001 IEEE, pages 2337-2343, International Conference on Robotics and Automation, Seoul, Korea, May 21-26, 2001.

As per claim 1:

Balaniuk discloses Long Elements Method (LEM) for real time physically based modeling of deformable medium (see on page 2337, "Abstract" section, lines 1-4), comprising the steps of:

providing a plurality of long elements(see on page 2339, "2.3 Long Elements" section, line 2); and

providing a meshing strategy (see on page 2339, "2.3 Long Elements" section, line 7) based on said plurality of long elements wherein number of said plurality of long elements is proportional to n^2 where n is a length of a side of said deformable medium (see on page 2341, "2. Physics" section, with a paragraph starting " A reference point and ..." lines 10-13) thereby substantially reducing number of time steps required by said modeling (see "Conclusion" section, line 5).

As per claim 2:

Balaniuk discloses a soft tissue (soft tissue; see on page 2338 the paragraph starting with " The method proposed..." line 2).

As per claim 3:

Balaniuk discloses an object filled with fluid (see on page 2337, "Abstract" section, line 6).

As per claim 4:

Balaniuk discloses soft tissue simulation, surgical simulation, unrestricted multi-modal interactive simulation including simulating interactive topological changes,

volumetric modeling for homogeneous and non-homogeneous materials, and graphic and haptic rendering (see on page 2338 the paragraph starting with " The method proposed..." lines 2-8).

As per claim 5:

Balaniuk discloses simulating deformations and dynamics of deformable medium (see on page 2338, a line starting with " instance, pre-calculation..." lines 5).

As per claim 6:

Balaniuk discloses elastic and plastic deformations (see on page 2338, a line starting with " instance, pre-calculation..." lines 5).

As per claim 7:

Balaniuk discloses simulating elastic deformation of said deformable medium wherein said deformable medium is object filled with fluid(see on page 2338 , a paragraph starting with " The approach is based on ..." lines 1 and 2).

As per claim 8:

Balaniuk discloses set of static equations, volume conservation, and Pascal principle (see on page 2338, a paragraph starting with " the approach is based on ..." lines 6-8 and on page 2339 equation 12).

As per claim 9:

Balaniuk discloses pressure, volume, stress, strain, position, and velocity (see page 2337, "Abstract" lines 10-11).

As per claim 10:

Balaniuk discloses long elements method (LEM) for real time physically based simulation of a deformable object (see on page 2337, "Abstract" section, lines 1-4), comprising the steps of:

Discretising volume of said deformable object with plurality of long elements (see on page 2339, "2.3 Long Elements" section, line 1 and 2) wherein number of said plurality of long elements is proportional to n^2 where n is a length of a side of said deformable object medium (see on page 2341, "2. Physics" section, with a paragraph starting " A reference point and ..." lines 10-13);

Providing a set of static equation (see on page 2338, a paragraph starting with " the approach is based on ..." lines 6-7) wherein each of said static equations is defined for each of said plurality of long elements using dynamic variables (see on page 2338, a paragraph starting with " The approach is based on ..." lines 5-6); and

Providing a static stateless deformation engine for simulating globally and physically consistent elastic deformations of said deformable objects (see on page 2338, a paragraph starting with " The approach is based on ..." lines 1-2 and 9-10).

As per claim 11:

The limitation of claim 11 has already been discussed in the rejection of claim 8. It is therefore rejected under the same rationale.

As per claim 12:

The limitation of claim 12 has already been discussed in the rejection of claim 9. It is therefore rejected under the same rationale.

As per claim 13:

The limitation of claim 13 has already been discussed in the rejection of claim 10. It is therefore rejected under the same rationale.

As per claim 14:

Balaniuk discloses a model definition module, simulation module, and rendering module (model definition, simulation loop and rendering loops; see on page 2340, "4. Method Implementation" section).

As per claim 15:

Balaniuk discloses simulating deformations, rendering graphic and rendering haptics (simulation loop, graphic loop and haptic loop; see on pages 2341-2342, "4.3 Main Loops" section).

As per claim 16:

Balaniuk discloses a client-server architecture allowing multi rendering and multi haptic interactions in a shared virtual environment (see on page 2340, "4.1 System organization" section; a paragraph starting with " The simulation and rendering..." lines 1-7).

As per claim 17:

Balaniuk discloses a network environment such that a plurality of users may simultaneously interact with said modeling (see on page 2340, "4.1 System organization" section; a paragraph starting with " The simulation and rendering..." lines 2-5).

As per claim 18:

Balaniuk discloses a Window NT (see on page 2340, " 4. Method Implementation" section, line 3).

As per claim 19:

Balaniuk discloses a portable device (haptic device; see on page 2342, " 4.4 Results" section, line 13-14)

As per claim 20:

Balaniuk disclose a personal computer (PC; see on page 2342, "4.4 Results" section, line 1).

As per claim 21:

Balaniuk discloses Long Elements Method (LEM) for real time physically based dynamic simulation of deformable medium, comprising the steps of:

Generating a plurality of long elements wherein each of said plurality of long elements is a one-dimension entity (see on page 2341, a paragraph starting with " A reference point ..." lines 3-4);

Meshing (see on page 2341, a paragraph starting with " A reference point ..." lines 2-5) said deformable medium based on said plurality of long elements (see on page 2339, "2.3 Long Elements" section, line 2) wherein number of said plurality of long elements is proportional to n^2 where n is a length of a side of said deformable medium (see on page 2341, "2. Physics" section, with a paragraph starting " A reference point and ..." lines 10-13); and

Simulating said deformable medium in at least two different dimensional spaces simultaneously, wherein said at least two different dimensional spaces comprising lower order dimension and higher order dimensions (reference point and Cartesian; see page 2341, a paragraph starting with "A reference point and a Cartesian..." of line 1).

As per claim 22:

Balaniuk discloses a reference plane (reference frame; see page 2341, a paragraph starting with "A reference point and a Cartesian..." of line 1).

As per claim 23:

Balaniuk discloses free form long elements (untouched elements; see page 2340, under a paragraph starting with "The untouched elements..." line 1).

As per claim 24:

Balaniuk discloses a one-dimension long element space and a three dimension Cartesian space (see page 2341, under a paragraph starting with "A reference point...", lines 3-6).

As per claim 25:

The limitation of claim 25 has already been discussed in the rejection of claim 21. It is therefore rejected under the same rationale.

As per claim 27:

The limitation of claim 27 has already been discussed in the rejection of claim 24. It is therefore rejected under the same rationale.

As per claim 28:

The limitation of claim 28 has already been discussed in the rejection of claim 23. It is therefore rejected under the same rationale.

As per claim 29:

The limitation of claim 29 has already been discussed in the rejection of claim 22. It is therefore rejected under the same rationale.

As per claim 30:

Balaniuk discloses mass less long elements attached to a particle of known mass (see on page 2339, "2.3 Long Elements" section, a paragraph starting with "A long element can be ..." lines 1-3 and 8-9).

As per claim 31:

The limitation of claim 31 has already been discussed in the rejection of claim 17. It is therefore rejected under the same rationale.

As per claim 32:

The limitation of claim 32 has already been discussed in the rejection of claim 18. It is therefore rejected under the same rationale.

As per Claim 33:

The limitation of claim 33 has already been discussed in the rejection of claim 19. It is therefore rejected under the same rationale.

As per claim 34:

The limitation of claim 34 has already been discussed in the rejection of claim 20. It is therefore rejected under the same rationale.

As per claim 35:

Balaniuk discloses a surgical interface (see on page 2342, "Future directions" section, second paragraph, line 1).

Conclusion

15. Any inquiring concerning this communication or earlier communication from the examiner should be directed to Kibrom K. Gebresilassie whose telephone number is (571) 272-8571. The examiner can normally be reached on Monday-Friday, 8:00 am to 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner supervisor, Jean R. Homere can be reached at (571) 272-3780. The official fax number:(703) 872-9306. Any inquiring of a general nature relating to the status of this application should be directed to the group receptionist whose telephone number is: (571) 272-3700.

JEAN R. HOMERE
PRIMARY EXAMINER